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Capital Gains Taxation and Stock Market Activity: Evidence from IPOs

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ABSTRACT

Prior to the Tax Reform Act of 1986 (TRA '86), long-term capital gains were taxed at a lower rate than short-term gains, presenting investors with an opportunity to increase their after-tax return by delaying the sale of appreciated assets until after they qualified for long-term status and selling depreciated assets prior to long-term qualification. Using a sample of Initial Public Offerings, I find that stocks that appreciated prior to long-term qualification exhibit increased volume and decreased returns just after their qualification date, while stocks that depreciated prior to long-term qualification exhibit these effects just prior to their qualification date.

IT IS GENERALLY ACKNOWLEDGED that capital gains taxes influence investor behavior. Slemrod (1982), Dyl (1979), Chaplinsky and Seyhun (1990), and others agree that "individuals rationally respond to specific provisions of the tax code in attempting to reduce the tax liability of investment income." Recently, this view has entered the public policy debate concerning the effective date of a proposed capital-gains tax cut. For example, *The Wall Street Journal* reported that Congress has considered making proposed capital gains tax cuts retroactive "to avoid possible market disruptions that might come from investors delaying transactions in anticipation of a future effective date" (*WSJ*, February 19, 1997).

Despite the consensus view that capital gains taxes influence investment behavior, specific distortions in behavior are difficult to document empirically. One reason for the lack of evidence regarding the distortionary effect of capital gains taxes is that it is extremely difficult for researchers to determine the initial cost and the date of purchase of an asset. Without that information, it is impossible for the investigator to know when an investor is trading a long-term or short-term asset, and whether he is realizing a gain or a loss.

One class of assets for which it is possible to obtain this information is initial public offerings of common stock (IPOs). By definition, IPOs are not available for purchase prior to their offer date. On the offer date, shares are

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sold to investors at the offer price. During the months following the offer date, there will be a group of shareholders in each of these firms for whom we know the purchase price and date of purchase of their investment. Using a sample of IPOs, one can measure any distortions in investor behavior when a stock changes from short-term to long-term status (for purposes of capital gains taxation) for that group of investors.

In this paper, I consider two samples of IPOs. The first sample consists of stocks issued while long-term capital gains were taxed at a significantly lower rate than short-term capital gains (1976–1986). The second consists of stocks issued when capital gains were, for the most part, treated the same as ordinary income (1989–1995). I separate each sample into two groups. The Appreciated group consists of stocks that appreciated in value prior to reaching long-term capital gains status, and the Depreciated group comprises those issues that depreciated in value prior to reaching long-term status. I then examine the volume of trading and the returns for each group surrounding the date on which each stock qualifies for long-term status. Two questions are addressed. First, do investors delay the sale of appreciated stock so that they can qualify for the tax advantages of long-term gains? Second, do they accelerate the sale of depreciated stock in order to obtain the tax benefits of short-term losses?

I find that during the years of lower tax rates for long-term gains, IPOs that appreciate prior to qualifying for long-term status experience an increase in trading volume after their qualifying date, as well as a decrease in returns. The IPOs from the same sample that depreciate prior to achieving long-term status experience the same results *prior* to their qualifying date. IPOs issued when there was no meaningful tax reduction for long-term capital gains do not experience these effects. These results are consistent with the arguments that investors delay the sale of appreciated assets to realize long-term gains and accelerate the sale of depreciated assets to lock in short-term losses when short-term and long-term gains are taxed differently.

The paper proceeds as follows: Section I reviews the tax laws pertaining to capital gains and losses and discusses why investors might alter their trading behavior around the time a stock qualifies for long-term capital gain (or loss) status; Section II describes the data and the methods used in the study; Section III presents the empirical results; and Section IV presents my conclusions.

I. Capital Gains Taxation

When an investor purchases an asset and later resells it at a price different from the one he paid for it, he experiences either a capital gain or a capital loss. Capital gains are taxable events and capital losses can be used to offset capital gains and/or be deducted from ordinary income and thus reduce taxes. Capital gains or losses are either short-term or long-term depending on the date of purchase and date of sale of the asset. Between 1970

Table I

Capital Gains Tax Treatment and Required Holding Periods

This table summarizes the tax treatment of capital gains and losses prior to the Tax Reform Act of 1986 (TRA '86) and the tax treatment of capital gains and losses after TRA '86.

Panel A: Tax Treatment of Capital Gains

	Pre-TRA '86	Post-TRA '86
Net long-term capital gains	Taxed at 40% of marginal tax rate	Taxed at 100% of marginal tax rate subject to 28% maximum rate
Net short-term capital gains	Taxed at 100% of marginal tax rate	Taxed at 100% of marginal tax rate
Net long-term capital losses	Offsets ordinary income at 2:1 rate* ($2 of long-term capital losses offsets $1 of ordinary income)	Offsets ordinary income at 1:1 rate*
Net short-term capital losses	Offsets ordinary income at 1:1 rate*	Offsets ordinary income at 1:1 rate*

Panel B: Required Holding Period of an Asset to Qualify for Long-Term Capital Gain or Loss Treatment

Prior to June 23, 1984: > 1 year
June 23, 1984 – December 31, 1987: > 6 months
After December 31, 1987: > 1 year

*Up to $3,000 per year with unused losses carried forward.

and 1996, Congress revised the law twice, so that the required holding period for a stock to qualify as a long-term investment is "more than one year" for assets acquired before June 23, 1984, or acquired after December 31, 1987. The long-term capital gain holding period is "more than six months" for assets acquired between June 22, 1984, and January 1, 1988 (*1990 U.S. Master Tax Guide*, paragraph 1777).

The Tax Reform Act of 1986 (TRA'86) significantly changed how long-term capital gains and losses are treated. In general, assets that qualified for long-term capital gains status and were sold prior to January 1, 1987, were taxed at 40 percent of an individual's marginal tax rate. Assets that qualified for long-term capital gains status and were sold after January 1, 1987, were taxed at the same rate as ordinary income, subject to a 28% maximum rate. A summary of the tax law is shown in Table I.

Constantinides (1984) shows that the optimal investment strategy under the pre-TRA '86 tax code is to realize losses short-term and realize gains long-term. In particular, if an investor experiences a liquidity shock a few days prior to an asset qualifying for long-term capital gain or loss status, he can expect a higher after-tax return by selling the stock prior to the quali-

fication date if the current price is below his purchase price, but would be better off waiting until after the qualification date to sell if the current price is above the purchase price.

The result is that prior to January 1, 1987, it was advantageous for most taxpayers to delay selling appreciated assets until they qualified for long-term status and to sell depreciated assets before they qualified for long-term status. Beginning in 1987, this tactic is only advantageous for those individuals with taxable incomes in excess of $115,000 ($140,000 for joint returns) and for these high-income taxpayers the tax savings have been significantly reduced.[1]

II. Data and Methods

A. The Data

The pre-TRA'86 data come from two sources. I combine samples from Loughran and Ritter (1995) and Affleck, Hegde, Miller and Reilly (1993). The Loughran and Ritter data contain IPOs issued from 1975 to 1984. The data from Affleck et al. consist of IPOs issued in 1985 and 1986. I include only those observations from the IPOs issued in 1986 which qualified for long-term status prior to January 1, 1987. The post-TRA '86 data are taken from Benveniste and Busaba (1995) and consist of all firm-commitment IPOs with an offer price of at least $3.00 issued from January 1989 to May 1995.[2]

I obtain price, volume, bid, ask, and return information on the stocks from the Center for Research in Security Prices (CRSP). Since my post-TRA '86 data set has a $3.00 offer-price filter built into it, I eliminate the pre-TRA '86 IPOs with an offer price of less than $3.00 so that the data will be comparable across periods.[3] This procedure results in a final sample size of 968 stocks for the pre-TRA '86 sample and 1,140 stocks for the post-TRA '86 sample. Since each sample is comparable with regard to the IPOs issued during those years, identical tests can be performed on the two samples, with the pre-TRA '86 sample being used as the test group and the post-TRA '86 sample as the control group. Table II lists the number of IPOs in each data set by the year that they qualified for long-term status.

To classify a stock as appreciated or depreciated, I consider weeks 4 through 6 (trading days 16–30) prior to the qualification date and compare each stock's daily closing price during that period with its offer price. If the closing price was at or above the offer price each day during those 15 trading days with at least one closing price above the offer, I consider the stock to

[1] For these taxpayers, the marginal Federal Income Tax rate is 36 percent, so a capital gains tax rate of 28 percent amounts to approximately half the tax savings they had prior to TRA '86.

[2] The $3.00 filter is used by Benveniste and Busaba to eliminate the highly speculative "penny stocks" from their sample. Because of their risk and the way they are marketed, penny stocks are often not representative of "investment-grade" stocks.

[3] This screen eliminates 127 stocks from the sample. I run all tests again with the 127 stocks included and the results do not noticeably change.

Table II

Number of Initial Public Offerings in Samples by Year

This table shows the number of initial public offerings (IPOs) in each sample according to the year they qualified for long-term capital gain or loss status for investors who bought shares on the offer date. Column A includes the IPOs that were issued prior to the Tax Reform Act of 1986 (pre-TRA '86). Column B includes the IPOs that were issued after the Tax Reform Act of 1986 (post-TRA '86).

Column A Pre-TRA '86 IPOs		Column B Post-TRA '86 IPOs	
Year	Number	Year	Number
1976	3	1989	63
1977	2	1990	70
1978	3	1991	68
1979	2	1992	165
1980	2	1993	246
1981	2	1994	272
1982	35	1995	256
1983	60		1140
1984	369		
1985	212		
1986	278		
	968		

have appreciated. If its closing price during weeks 4 through 6 prior to the qualification date was below the offer price at least once, but never above the offer price, I classify it as depreciated.[4] Figure 1 shows the amount of appreciation and depreciation within each sample.

In the pre-TRA '86 sample, I classify 420 stocks as appreciated relative to their offer price, 444 stocks as depreciated from their offer price, and 104 stocks in neither category because their price was above their offer price on at least one of the 15 days in the determination period and below their offer price on at least one other of the 15 days. In the post-TRA '86 sample, 599 stocks appreciated, 449 stocks depreciated, and 92 stocks fell in neither category. The mean and median offer price for each group is virtually the same.

B. The Tests

If a stock has appreciated since it was purchased and the investor decides to sell it to rebalance his portfolio, he has to either sell it prior to its qualification date at the observable price or wait and sell it after its qualification date at an unknown future price. Investors face a distribution of possible

[4] I use weeks four through six because my examination of trading behavior is conducted for the period from three weeks prior to the qualification date to three weeks after the qualification date. This procedure allows for independence between trading behavior and selection because the categorization of the stocks is completed before the trading behavior analysis begins.

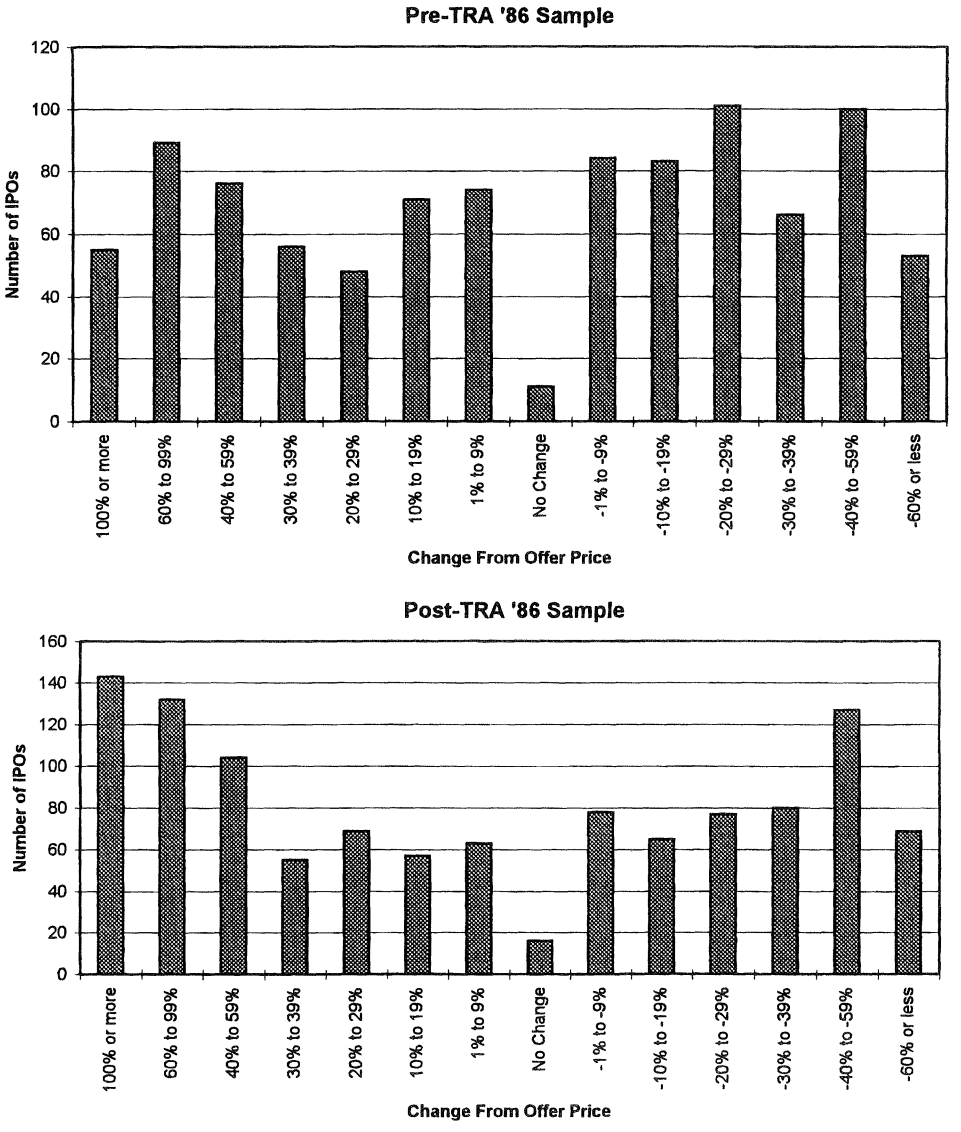

Figure 1. Amount of appreciation or depreciation of the initial public offerings (IPOs) in each sample. Panels A and B show the percentage change in price of the IPOs used in this study. Panel A is the sample of IPOs that were issued prior to the Tax Reform Act of 1986 (pre-TRA '86 Sample). Panel B is the sample of IPOs that were issued after the Tax Reform Act of 1986 (post-TRA '86 Sample). The change in price is calculated as the difference between the stock's price 16 days prior to long-term qualification and its offer price divided by the offer price.

prices for the stock after qualification and can be expected to postpone the sale if the certainty equivalent of the after-tax return from waiting exceeds the after-tax return from a current sale.

As the time until qualification increases, the costs associated with holding an unwanted security increase. We expect therefore to observe the most "waiting" for long-term status just prior to qualification. I examine market activity three weeks (15 trading days) before qualification for appreciated stocks and one week (5 trading days including the qualification day) after qualification to see if there is evidence that investors postponed the decision to sell these appreciated stocks to take advantage of the long-term capital gains tax reduction. I consider the entire week after qualification because, for a variety of reasons, an investor might not have sold the stock the first day it qualified (after all, it is still a long-term gain two days after qualification).

The process is symmetric for depreciated stocks. In order to lock in a short-term loss, an investor must sell the stock prior to the qualification date. It need not be the day before, but the decision to sell has a higher expected value closer to the qualification date. I choose to examine the five trading days prior to qualification and analyze the market activity over that time period in comparison with the three weeks after qualification.

We expect to see a more significant effect with depreciated stock than with appreciated stock because there is a nonnegotiable time limit on the owner of a depreciated stock. To lock in a short-term capital loss, the investor *must* act prior to the qualification date and cannot change his mind later. There is no such time limit for the owner of an appreciated stock. He can sell the stock anytime after qualification and receive favorable long-term gains treatment.[5]

C. Predictions About Volume

Suppose that a subset of investors held appreciated stock prior to TRA '86, and during the three weeks preceding the stock's qualification they decided to sell the stock but to postpone the sale until after the qualification date. We would expect to observe higher trading volume in that stock during the week after qualification relative to the three weeks prior to qualification. For IPOs issued after TRA '86, there is less reason to postpone, so we should observe a smaller volume change or none at all.

Similarly, suppose a subset of investors held depreciated stock prior to TRA '86, and they decided to lock in short-term capital losses by selling the stock prior to its qualification date. We would expect to observe higher trading volume during the week prior to qualification relative to the three weeks after qualification. Again, such a change in volume should be less pronounced or nonexistent for post-TRA '86 IPOs.

[5] In Constantinides' (1984) model, the optimal strategy is to sell as soon as the appreciated asset qualifies and to immediately repurchase the asset in order to reestablish a short-term basis. In practice, transactions costs as well as potential scrutiny by the IRS limit the viability of this strategy.

D. Predictions About Returns

If a subset of investors who hold appreciated stock prior to TRA '86 delay the sale of that stock until after the qualification date, the abnormally high volume during the week after qualification is due to a surplus of sell orders. Given this price pressure, we would expect to see the stock's price drop during the week after qualification, resulting in an abnormally low return for that week relative to the returns during the three weeks prior to qualification.[6] For stocks issued after TRA '86, a change in returns, if there is one, should be smaller.

Similarly, if a subset of investors holds a depreciated stock prior to TRA '86, and they decide to lock in their short-term capital loss by selling the stock prior to the qualification date, the selling pressure should result in abnormally low returns for that stock the week prior to qualification relative to the three weeks after. For stocks issued after TRA '86, there should be a smaller drop in returns, if any at all.

III. Empirical Results

A. Volume

To examine volume around a stock's qualification date, I scale the CRSP reported daily volume in a stock by the number of shares outstanding for the stock on that day. This scaling gives me a turnover rate that has the same interpretation for all firms in the sample.[7] I total the turnover rate for the five trading days in the week and multiply by 100 to calculate the mean and median percentage of shares outstanding that were traded during the week.

Table III presents the mean and median turnover rates for the three weeks prior to, the week of, and the two weeks following the qualification date (week 0 is the five trading days beginning with the first day the security is eligible for long-term gain or loss treatment). The data are separated into two samples: stocks that qualified prior to January 1, 1987, and those that qualified after January 1, 1987. Within each of those samples, I separate the stocks into three groups: those that clearly appreciated, those that clearly depreciated, and those that neither clearly appreciated nor depreciated (Mixed). I also report the aggregate results for all stocks in each sample.

Panel A of Table III shows that for the pre-TRA '86 group, the stocks that appreciated have a distinctively higher volume in week 0 (the first week they are eligible to be sold as a long-term capital gain for those investors who bought them on the issue date). The stocks that depreciated in the

[6] Abnormal returns due to price pressure have been documented and discussed by Ritter (1988) and others.

[7] See Foster and Viswanathan (1993) for more discussion of this approach to scaling.

Table III

Mean Weekly Trading Volume as a Percentage of Shares Outstanding

This table presents the mean and median (in parentheses) weekly turnover rates (CRSP reported trading volume divided by the number of shares outstanding times 100) of a group of initial public offerings (IPOs) for the three weeks prior to, the week of, and the two weeks after each stock's qualification date (for long-term capital gain or loss status). Week 0 is the five trading days beginning with the first day the security is eligible for long-term gain or loss treatment for an investor who purchased the IPO on its offer date. The data are separated into two samples: stocks that qualified prior to January 1, 1987, and those that qualified after January 1, 1987. January 1, 1987, was the effective date for the Tax Reform Act of 1986 (TRA '86). Prior to TRA '86, investors could increase their after-tax returns by selling appreciated stock after their qualification date and selling depreciated stock prior to the qualification date. After TRA '86, that opportunity no longer existed for most investors. Within each of the samples I separate the stocks into three groups: those that clearly appreciated, those that clearly depreciated, and those that neither clearly appreciated nor depreciated (mixed).

Panel A: Pre-TRA '86 Sample (Expected increases in bold)

Week	N = 420 Appreciated	N = 444 Depreciated	N = 104 Mixed	N = 968 Total
+2	2.016 (1.250)	1.304 (0.681)	1.991 (1.222)	1.687 (0.936)
+1	2.078 (1.333)	1.158 (0.642)	1.753 (1.208)	1.621 (0.951)
0	**2.260 (1.384)**	1.244 (0.739)	1.959 (1.309)	1.761 (1.037)
−1	2.162 (1.109)	**1.329 (0.803)**	2.032 (1.339)	1.766 (0.962)
−2	2.071 (1.168)	1.139 (0.613)	1.667 (1.132)	1.600 (0.895)
−3	1.878 (1.111)	1.077 (0.588)	1.637 (1.086)	1.485 (0.806)

Panel B: Post-TRA '86 Sample (Potential increases in bold)

Week	N = 599 Appreciated	N = 449 Depreciated	N = 92 Mixed	N = 1140 Total
+2	4.907 (2.694)	2.431 (1.234)	4.096 (2.213)	3.867 (1.934)
+1	4.575 (2.657)	2.604 (1.128)	3.730 (1.790)	3.731 (1.836)
0	**4.613 (2.766)**	2.371 (1.047)	3.268 (1.706)	3.621 (1.860)
−1	4.710 (2.799)	**2.432 (1.133)**	4.026 (2.049)	3.758 (1.781)
−2	4.618 (2.471)	2.192 (1.088)	3.614 (1.575)	3.581 (1.702)
−3	4.208 (2.630)	2.336 (1.105)	4.681 (2.094)	3.509 (1.838)

pre-TRA '86 sample show a higher volume in week −1 (the last week they can be sold for a short-term loss). Panel B of Table III indicates that the post-TRA '86 group does not exhibit a similar pattern.[8]

One clear pattern seen in Table III is a higher volume of trading in the appreciated stocks than in the depreciated stocks. A possible explanation for this finding is that IPOs that increase in price shortly after their issue

[8] I also examine the mean and median *daily* volumes for the pre-TRA '86 sample (not reported). For the Appreciated group, the greatest volume occurs on the first day the stock is eligible to be sold for a long-term gain; for the Depreciated group, the greatest volume occurs on the last day the stock is eligible to be sold for a short-term loss.

attract more investor attention than those that decrease in price. We also observe higher trading volume in the post-TRA '86 group than in the pre-TRA '86 group. This finding is consistent with the fact that Nasdaq volume in general has increased over the last ten years.[9]

I test in three different ways the hypothesis that the volume differences are significantly different from zero. First I use a standard difference of means in paired data test. This test rejects the hypothesis at the 95 percent level that the pre-TRA '86 Appreciated group has the same mean volume in week 0 as in weeks −1, −2, or −3 and that the Depreciated group has the same mean volume in week −1 as in weeks 0, +1, or +2. It does not reject those hypotheses for either group in the post-TRA '86 sample.

Second, I perform the nonparametric Bernoulli test, which examines the number of stocks in the Appreciated group which have their highest volume in week 0 and the number in the Depreciated group which have their highest volume in week −1. The Bernoulli test results indicate (at the 99 percent level of significance) that an unusually high number of stocks in the Appreciated group experience a higher volume in week 0 than in weeks −1, −2, or −3, and that an unusually high number of stocks in the Depreciated group experience a higher volume in week −1 than in weeks 0, +1, or +2.

The third test utilizes linear regression. Within each group (Appreciated and Depreciated), I regress the log of the weekly volume in each stock on a set of dummy variables for whether the volume comes from week −3, −2, −1, 0, +1, or +2. I then interact each dummy with a variable for the amount of appreciation in the stock since its offer date (depreciation being thought of as negative appreciation). The resulting coefficients indicate the effect of appreciation or depreciation on realization behavior, as well as the effect of timing relative to the qualification date on this behavior.

We would expect the week 0 coefficient for the Appreciated group from this regression to be *higher* than the coefficients for weeks −1, −2, and −3 if a stock's appreciation leads to a higher volume immediately after the qualification date. Similarly, we would expect the week −1 coefficient to be *lower* than those for weeks 0, +1, and +2 for the Depreciated group, if a stock's depreciation (negative appreciation) leads to a higher volume just prior to the qualification date.

The results of this test are reported in Columns A and C of Table IV.[10] In addition to the six weeks surrounding the qualification date, I also include results for weeks −5, −9, −13, +5, +9, and +13. These weeks are the five

[9] Although the upward trend in Nasdaq volume has been gradual and nonmonotonic, it may be partly responsible for the higher volumes found in the Appreciated group during the week after qualification since for each stock that week comes after the three weeks I compare it to. To whatever extent the results are weakened in the Appreciated group though, they are strengthened in the Depreciated group for the same reason because the higher volume comes during the week *prior* to qualification and it is compared to the following three weeks.

[10] All standard errors are adjusted using White's (1980) heteroskedasticity-consistent covariance matrix estimator.

trading day time periods occurring at one, two, and three months before and after qualification. They allow us to view the activity around the qualification date through a wider lens.

In the pre-TRA '86 sample (Column A), for the Appreciated group, we can reject at the 97 percent confidence level that the week 0 coefficient is less than or equal to any of the prequalification date coefficients (weeks −1 through −13). For the Depreciated group, we can reject at the 98 percent level that the coefficient for week −1 is greater than or equal to any of the postqualification date coefficients (weeks 0 through +13). In the post-TRA '86 sample (Column C), the week 0 coefficient for the Appreciated group is not statistically greater than any of the prequalification coefficients. In the Depreciated group, we fail to reject (at 95 percent) that the week −1 coefficient is less than that for weeks 0, +1, +2, or +5. These results suggest that investors delay the sale of an appreciated asset until after it qualifies for long-term capital gains status and accelerate the sale of a depreciated asset in order to ensure a short-term loss when there is a tax incentive to do so.

If the unusually high volumes for the weeks of interest in the pre-TRA '86 group are caused by investors seeking to realize long-term gains or short-term losses, the investors whose assets appreciated the most are potentially the most likely to delay the sale of their stock until after qualification, and those investors whose stocks depreciated the most are potentially the most likely to sell prior to qualification. On the other hand, the stocks with the greatest appreciation and depreciation may be the *least likely* to be sold as investors seek to maximize their terminal period wealth by indefinitely postponing the realization of their capital gains[11] and in the case of a significant depreciation they may be reluctant to realize a larger loss due to a disposition effect.[12]

To test these issues, I repeat the previous regressions on a subsample from each group. From the Appreciated group, I select those stocks that appreciated by 100 percent or more from their offer date to the close of trading three weeks prior to their qualification date. From the Depreciated group, I consider stocks that depreciated by 60 percent or more from their offer price during the same time period.[13]

The results of the regressions are reported in Columns B and D of Table IV. In the pre-TRA '86 sample, the coefficients are highest (lowest) in the predicted weeks for the subsamples from each group, but the standard errors are large enough so that the differences are not statistically significant. It is thus difficult to claim that significantly greater appreciation or

[11] Investors can avoid capital gains entirely by holding appreciated assets until death when their beneficiaries receive them with a stepped-up cost basis.

[12] Shefrin and Statman (1985) maintain that investors experience a reluctance to sell depreciated stocks because it forces them to admit they made a mistake.

[13] I select +100 percent and −60 percent because these returns give me approximately the same number of stocks in each group of the pre-TRA '86 sample.

Table IV

The Effect of Total Returns to Date on a Stock's Trading Volume During the Weeks Around its Long-Term Qualification Date

This table presents the coefficients and standard errors (in parentheses) for a regression of the natural logarithm of an initial public offering's (IPO's) weekly volume on its price appreciation since date of issue, interacted with a dummy variable for the week that the volume comes from. Volume is measured as the Center for Research in Security Prices reported trading volume for a stock divided by the number of shares outstanding times 100. Week 0 is the five trading days beginning with the first day the security is eligible for long-term gain or loss treatment for an investor who purchased the IPO on its offer date. Week −1 is the five trading days just prior to long-term qualification. Each column is separated into two groups: those stocks that clearly appreciated between their offer date and qualification date, and those that clearly depreciated. Column A includes the full sample of IPOs that were issued prior to the Tax Reform Act of 1986 (pre-TRA '86 IPOs). Column B includes only those pre-TRA '86 IPOs that appreciated by at least 100 percent (Big Gainers) or depreciated by at least 60 percent (Big Losers) between their offer date and the date three weeks prior to their long-term qualification. Column C includes the full sample of IPOs that were issued after the Tax Reform Act of 1986 (post-TRA '86 IPOs), and Column D includes only the Big Gainers and Big Losers from the post-TRA '86 sample. If reduced tax rates for long-term capital gains motivate investors to sell appreciated stock after the qualification date and depreciated stock prior to the qualification date, we expect the highest coefficient for the Appreciated group to be found in week 0 and the lowest coefficient for the Depreciated group to be found in week −1. These critical weeks are shown in bold.

Week	Column A Pre-TRA '86 Full Sample		Column B Pre-TRA '86 Big Gainers & Losers		Column C Post-TRA '86 Full Sample		Column D Post-TRA '86 Big Gainers & Losers	
	N = 420 Apprec.	N = 444 Deprec.	N = 58 Apprec.	N = 54 Deprec.	N = 599 Apprec.	N = 449 Deprec.	N = 136 Apprec.	N = 64 Deprec.
+13	0.4284	0.9229	0.2647	1.2063	0.4890	0.6035	−0.0355	0.0424
	(0.0679)	(0.1445)	(0.1277)	(0.6148)	(0.0569)	(0.1543)	(0.0532)	(0.5221)
+9	0.4335	0.9996	0.1686	1.2706	0.4810	0.5875	−0.0189	−0.0726
	(0.0701)	(0.1468)	(0.1103)	(0.5775)	(0.0582)	(0.1633)	(0.0545)	(0.5236)
+5	0.3035	0.6381	0.1407	0.6537	0.4364	0.1531	−0.0592	−0.5384
	(0.0698)	(0.1501)	(0.1072)	(0.5655)	(0.0654)	(0.1669)	(0.0660)	(0.5028)
+2	0.4603	0.5584	0.0528	0.6915	0.4651	0.0855	−0.0793	−0.2331
	(0.0775)	(0.1508)	(0.1034)	(0.5740)	(0.0664)	(0.1595)	(0.0311)	(0.4929)
+1	0.5171	0.8236	0.0782	0.7136	0.4152	0.0926	−0.1087	−0.3627
	(0.0759)	(0.1577)	(0.1042)	(0.5760)	(0.0661)	(0.1613)	(0.0603)	(0.4470)
0	**0.6406**[a]	0.5670	**0.2112**	0.6919	**0.3982**	0.1652	**−0.1221**	−0.2726
	(0.0735)	(0.1640)	(0.0980)	(0.6135)	(0.0610)	(0.1558)	(0.0549)	(0.5146)
−1	0.4818	**0.1585**[b]	0.1502	**0.3184**	0.4355	**0.0763**	−0.1245	**−0.3304**
	(0.0806)	(0.1470)	(0.1097)	(0.5740)	(0.0709)	(0.1675)	(0.0660)	(0.4652)
−2	0.3580	0.6726	0.0213	0.6175	0.3974	0.3151	−0.1220	−0.1202
	(0.0737)	(0.1574)	(0.1097)	(0.6411)	(0.0659)	(0.1672)	(0.0586)	(0.5062)
−3	0.3678	0.8211	0.1098	0.9211	0.4126	0.1592	−0.1041	−0.1586
	(0.0777)	(0.1638)	(0.1019)	(0.6411)	(0.0675)	(0.1744)	(0.0586)	(0.5092)
−5	0.3035	0.8088	0.0233	0.8553	0.4532	0.1706	−0.0388	−0.0759
	(0.0742)	(0.1755)	(0.1021)	(0.6267)	(0.0633)	(0.1766)	(0.0581)	(0.5539)
−9	0.4335	0.9655	0.1758	0.8338	0.4034	0.2426	−0.1014	−0.2102
	(0.0906)	(0.1904)	(0.1367)	(0.6726)	(0.0644)	(0.1904)	(0.0569)	(0.5865)
−13	0.4284	1.0992	0.0490	0.9733	0.3973	0.1261	−0.1276	−0.5304
	(0.8200)	(0.2316)	(0.1115)	(0.7698)	(0.0662)	(0.1672)	(0.0637)	(0.5692)

[a]Greater than weeks −1 through −13 at the 97 percent confidence level.
[b]Less than weeks 0 through +13 at the 98 percent confidence level.

depreciation either strengthens or weakens the incentive to time the sale for tax purposes. It is interesting to note though, that for both samples (pre- and post-TRA '86), each week's coefficient is lower for the subsamples with the large appreciation or depreciation than for the corresponding week with the full sample. This indicates that there is *less* volume each week in the Big Gainers group and *more* volume each week in the Big Losers group.

Since only taxable investors have a motive to alter the timing of their transactions, I repeat the previous regressions with the addition of a variable designed to proxy for the percentage of shares held by taxable investors. To do so, I obtain data on the percentage of institutional ownership (taxable and nontaxable) as of the start of the quarter prior to the qualifying date from 13-F SEC filings for 618 of the 968 stocks in the pre-TRA '86 sample. I subtract the institutional ownership percentage from one to obtain the proportion of noninstitutional ownership and interact that variable with the level of appreciation or depreciation. The results do not significantly change.[14]

Prior to 1987, we might expect the demand for realized losses to be greater in times when the market as a whole has generated high returns because investors are more likely to have large realized gains from other sources that they wish to offset. I test for this effect and compare the magnitude of the tax-motivated selling in the Appreciated group versus the Depreciated group through an additional regression. Within each group, I regress the abnormal volume during the critical week on the amount of appreciation or depreciation in that stock as well as the total return on the S&P 500 for the previous six months:

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \epsilon \tag{1}$$

where $x_1 = (\text{Price}_{\text{day } -16} - \text{Price}_{\text{offer}})/\text{Price}_{\text{offer}}$, x_2 = total return for the S&P 500 for the six months prior to day -16, $y = \ln \text{Vol.}_{\text{Wk } 0} - ((\ln \text{Vol.}_{\text{Wk } -1} + \ln \text{Vol.}_{\text{Wk } -2} + \ln \text{Vol.}_{\text{Wk } -3})/3)$ for Appreciated Stock, and $y = \ln \text{Vol.}_{\text{Wk } -1} - ((\ln \text{Vol.}_{\text{Wk } 0} + \ln \text{Vol.}_{\text{Wk } +1} + \ln \text{Vol.}_{\text{Wk } +2})/3)$ for Depreciated Stock.

We predict a positive relation between the first explanatory variable and the dependent variable for the appreciated stock because a greater return for a stock (more appreciation) means the taxpayer has more incentive to delay the sale to week 0. We should thus see a greater difference between the week 0 volume and the average volume for the prior three weeks. We expect a negative relationship for the depreciated stock because a larger negative return (more depreciation) means the taxpayer has more incentive to not delay the sale. This should mean a higher volume in week -1 relative to the subsequent three weeks. The aggregate market movements should be positively related to increased volume in week -1 for depreciated stock since

[14] One reason for the lack of additional influence of this variable may be that the percent of institutional ownership of these stocks did not contain significant cross-sectional differences. No stock had more than 50 percent institutional ownership and most were between 25 and 30 percent.

higher market returns should provide more realized gains for investors and thus a greater incentive to capture a short-term rather than a long-term loss. We would not necessarily predict any relation between market movements and abnormal volume for appreciated stock in week 0 because the tax incentive to take gains as long-term is the dominant strategy as long as an investor has taxable income for the year.

For the pre-TRA '86 sample the results are of the predicted signs, and the coefficients for the Depreciated group are significantly different from zero. Comparing the stock return coefficients for the Appreciated and Depreciated groups, we can reject at the 95 percent level that the absolute value of the depreciated coefficient is less than or equal to the appreciated coefficient. This finding is consistent with the notion that there is a stronger incentive to lock in a short-term loss just prior to qualification than to establish a long-term gain just after qualification.

The coefficients in the equations for the post-TRA '86 sample are not significantly different from zero. Along with the other tests, these results suggest that in the absence of a capital gains tax-rate differential, investors have no incentive to alter the timing of their transactions.

B. Returns

I compute returns using CRSP daily data and adjust for marketwide movements using the Nasdaq Composite Index as a measure of the market return.[15] The mean and median weekly returns are contained in Table V. My arguments suggest that for the pre-TRA '86 sample, there will be lower median and mean market-adjusted returns during week 0 for the Appreciated group, and during week -1 for the Depreciated group. The data in Panel A confirm this prediction. Of particular note is the Depreciated group, where the mean abnormal returns for all three weeks prior to qualification are negative and the returns for all three weeks after qualification are positive.[16]

To test the hypothesis that returns are lower during week 0 for the Appreciated group and during week -1 for the Depreciated group, I run tests on the returns data in the same manner as I did the volume data. A test for the difference of means in paired data allows us to reject at 95 percent the null hypothesis that the week 0 mean return for the Appreciated group is greater than or equal to the week -1, -2, or -3 mean. Similarly, we reject the null for week -1 for the Depreciated group. The Bernoulli tests on the returns data are significant at 99 percent.

[15] Since these stocks are all initially issued within 12 months of the qualification date, they are virtually all Nasdaq stocks. I also perform the tests without adjusting for market returns and obtain similar results.

[16] I also examine the mean and median abnormal *daily* returns for the pre-TRA '86 sample. For the Appreciated group, the lowest return coincides with the first day the stock is eligible to be sold for a long-term gain. For the Depreciated group, 13 of the 15 days prior to the qualification date experience negative mean abnormal returns but only 4 of the 15 days after the qualification date show negative returns.

Table V

Mean Abnormal Weekly Returns

This table presents the mean and median (in parentheses) weekly market adjusted returns of a group of initial public offerings (IPOs) for the three weeks prior to, the week of, and the two weeks after each stock's qualification date (for long-term capital gain or loss status). Week 0 is the five trading days beginning with the first day the security is eligible for long-term gain or loss treatment for an investor who purchased the IPO on its offer date. The data are separated into two samples: stocks that qualified prior to January 1, 1987, and those that qualified after January 1, 1987. January 1, 1987, was the effective date for the Tax Reform Act of 1986 (TRA '86). Prior to TRA '86, investors could increase their after-tax returns by selling appreciated stock after their qualification date and selling depreciated stock prior to the qualification date. After TRA '86, that opportunity no longer existed for most investors. Within each of the samples I separate the stocks into three groups: those that clearly appreciated, those that clearly depreciated, and those that neither clearly appreciated nor depreciated (mixed).

Panel A: Pre-TRA '86 Sample (Expected decreases in bold)

Week	N = 420 Appreciated	N = 444 Depreciated	N = 104 Mixed	N = 968 Total
+2	0.0013 (−0.0037)	0.0033 (−0.0026)	−0.0011 (−0.0096)	0.0020 (−0.0041)
+1	0.0023 (−0.0005)	0.0007 (−0.0077)	−0.0005 (0.0000)	0.0013 (−0.0041)
0	**−0.0099 (−0.0105)**	0.0023 (−0.0032)	−0.0050 (−0.0114)	−0.0038 (−0.0080)
−1	0.0004 (−0.0031)	**−0.0149 (−0.0146)**	−0.0103 (−0.0107)	−0.0078 (−0.0092)
−2	−0.0004 (−0.0049)	−0.0125 (−0.0126)	0.0089 (−0.0011)	−0.0049 (−0.0086)
−3	−0.0034 (−0.0054)	−0.0065 (−0.0112)	0.0025 (−0.0377)	−0.0042 (−0.0076)

Panel B: Post-TRA '86 Sample (Potential decreases in bold)

Week	N = 599 Appreciated	N = 449 Depreciated	N = 92 Mixed	N = 1140 Total
+2	−0.0016 (0.0008)	−0.0039 (−0.0055)	−0.0058 (−0.0074)	−0.0028 (−0.0026)
+1	−0.0028 (−0.0027)	−0.0041 (−0.0045)	0.0040 (−0.0001)	−0.0028 (−0.0028)
0	**−0.0019 (−0.0057)**	−0.0073 (−0.0142)	0.0081 (0.0048)	−0.0032 (−0.0089)
−1	−0.0030 (−0.0023)	**−0.0009 (−0.0085)**	−0.0067 (−0.0079)	−0.0025 (−0.0051)
−2	−0.0009 (0.0027)	−0.0008 (−0.0073)	0.0033 (−0.0410)	−0.0005 (−0.0021)
−3	−0.0016 (−0.0044)	−0.0064 (−0.0093)	0.0062 (0.0031)	−0.0029 (−0.0058)

The results of the regression tests are reported in Columns A and C of Table VI. These regressions are identical to those in Table IV except that abnormal total return for the five trading days is substituted as the dependent variable. For the Appreciated group, if price appreciation results in selling pressure during week 0, we would expect the week 0 coefficient to be lower than the coefficients for weeks −1 through −13. We observe this difference and it is significant at the 95 percent level. If, however, for the Depreciated group, price *depreciation* leads to selling pressure and lower returns *prior* to the qualification date, we would expect to see a higher coefficient for week −1 than for weeks 0 through +13. We also observe this effect, which is significant at the 99 percent level.

As with volume, I run the returns regressions on the subsamples from each group that experienced the greatest amount of appreciation or depreciation (+100 percent for the Appreciated group and −60 percent for the

Depreciated group). The results are found in Columns B and D of Table VI. Again, for the pre-TRA '86 sample, the coefficients are highest (lowest) in the predicted weeks, but the standard errors are large enough so that the differences are not statistically significant, thus leaving us with inconclusive results.

I test for the significance of overall market movements by running a regression on the returns data in the same manner as with volume:

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \epsilon \tag{2}$$

where $x_1 = (\text{Price}_{\text{day } -16} - \text{Price}_{\text{offer}})/\ \text{Price}_{\text{offer}}$, x_2 = total return for the S&P 500 for the six months prior to day -16, $y = \text{Ret.}_{\text{Wk } 0} - ((\text{Ret.}_{\text{Wk } -1} + \text{Ret.}_{\text{Wk } -2} + \text{Ret.}_{\text{Wk } -3})/3)$ for Appreciated Stock, and $y = \text{Ret.}_{\text{Wk } -1} - ((\text{Ret.}_{\text{Wk } 0} + \text{Ret.}_{\text{Wk } +1} + \text{Ret.}_{\text{Wk } +2})/3)$ for Depreciated Stock.

For the pre-TRA '86 sample the signs are as predicted and the stock return statistics are significant at the 99 percent confidence level while the market return statistic for the Depreciated group is significant at 95 percent. Also, the stock return coefficient for the Depreciated group is more than four times as large as the absolute value of the coefficient for the Appreciated group. I reject the null hypothesis that the depreciated stock's coefficient is lower at the 99 percent level. This result is consistent with the view that there is a greater incentive to lock in short-term losses than long-term gains, but that both are strongly influenced by the level of the tax incentive. The post-TRA '86 coefficients are either of the "wrong" sign or are not significantly different from zero, indicating that in the absence of the tax motivation investors do not alter their trading patterns. For robustness, all tests are run again using the market model $y = \alpha + \beta x + \epsilon$, where α and β are estimated for each stock using returns from day -76 to day -16. The regression coefficients and standard errors using this framework are not significantly different.

Prior to 1992, CRSP recorded the closing bid and ask quotes for non-National Market System (NMS) stocks and the closing price (without the quotes) for all NMS stocks. Thus, for my pre-TRA '86 data, of the 968 stocks in the final sample, CRSP has the closing bid and ask quotes for 707 issues. For my post-TRA '86 data, of the 1140 stocks in the final sample, CRSP has the closing bid and ask quotes for only 34 of them. The availability of the closing bid and ask quotes for a significant proportion of the pre-TRA '86 sample allows me to confirm that the observed lower returns are not merely the result of the bid-ask bounce.

I examine changes in both the bid and the ask (separately) during each of the three weeks prior to and after qualification. I find that for the Appreciated group, both the bid and the ask drop significantly during week 0, and for the Depreciated group, the bid and the ask each drop significantly during week -1. These results allow us to reject the possibility of the lower returns being attributed to a bid-ask bounce.

Table VI

The Effect of Total Returns to Date on a Stock's Returns During the Weeks Around its Long-Term Qualification Date

This table presents the coefficients and standard errors (in parentheses) for a regression of an initial public offering's (IPO's) weekly market-adjusted returns on its price appreciation since date of issue interacted with a dummy variable for the week that the return comes from. Week 0 is the five trading days beginning with the first day the security is eligible for long-term gain or loss treatment for an investor who purchased the IPO on its offer date. Week −1 is the five trading days just prior to long-term qualification. Each column is separated into two groups: those stocks that clearly appreciated between their offer date and qualification date, and those that clearly depreciated. Column A includes the full sample of IPOs that were issued prior to the Tax Reform Act of 1986 (pre-TRA '86 IPOs). Column B includes only those pre-TRA '86 IPOs that appreciated by at least 100 percent (Big Gainers) or depreciated by at least 60 percent (Big Losers) between their offer date and the date three weeks prior to their long-term qualification. Column C includes the full sample of IPOs that were issued after the Tax Reform Act of 1986 (post-TRA '86 IPOs), and Column D includes only the Big Gainers and Big Losers from the post-TRA '86 sample. If reduced tax rates for long-term capital gains motivate investors to sell appreciated stock after the qualification date and depreciated stock prior to the qualification date, we expect the lowest coefficient for the Appreciated group to be found in week 0 and the highest coefficient for the Depreciated group to be found in week −1. These critical weeks are shown in bold.

Week	Column A Pre-TRA '86 Full Sample		Column B Pre-TRA '86 Big Gainers & Losers		Column C Post-TRA '86 Full Sample		Column D Post-TRA '86 Big Gainers & Losers	
	$N = 420$ Apprec.	$N = 444$ Deprec.	$N = 58$ Apprec.	$N = 54$ Deprec.	$N = 599$ Apprec.	$N = 449$ Deprec.	$N = 136$ Apprec.	$N = 64$ Deprec.
+13	−0.0042	−0.0041	−0.0175	−0.0601	0.0010	−0.0175	−0.0010	−0.1688
	(0.0048)	(0.0100)	(0.0077)	(0.0399)	(0.0037)	(0.0142)	(0.0040)	(0.0630)
+9	0.0002	−0.0118	−0.0145	−0.0984	−0.0009	−0.0447	0.0026	−0.2272
	(0.0042)	(0.0093)	(0.0068)	(0.0388)	(0.0051)	(0.0225)	(0.0050)	(0.0822)
+5	−0.0003	−0.0256	−0.0060	−0.1417	0.0041	−0.0257	0.0047	−0.1495
	(0.0041)	(0.0152)	(0.0055)	(0.0553)	(0.0049)	(0.0193)	(0.0050)	(0.0700)
+2	−0.0038	−0.0136	−0.0133	−0.0463	0.0103	0.0181	0.0048	−0.1513
	(0.0047)	(0.0130)	(0.0056)	(0.0454)	(0.0036)	(0.0166)	(0.0037)	(0.0631)
+1	0.0044	−0.0342	−0.0011	−0.1425	−0.0052	−0.0165	−0.0020	−0.1686
	(0.0053)	(0.0154)	(0.0074)	(0.0490)	(0.0035)	(0.0194)	(0.0037)	(0.0721)
0	**−0.0148**[a]	−0.0185	**−0.0149**	−0.0907	**−0.0059**	−0.0108	**−0.0074**	−0.1789
	(0.0043)	(0.0129)	(0.0058)	(0.0458)	(0.0033)	(0.0175)	(0.0036)	(0.0679)
−1	0.0017	**0.0319**[b]	−0.0037	**−0.0253**	−0.0050	**−0.0329**	−0.0050	**−0.2328**
	(0.0041)	(0.0121)	(0.0062)	(0.0462)	(0.0037)	(0.0252)	(0.0038)	(0.0813)
−2	−0.0005	0.0111	−0.0046	−0.0827	−0.0013	−0.0178	0.0004	−0.1463
	(0.0039)	(0.0153)	(0.0056)	(0.0530)	(0.0033)	(0.0200)	(0.0034)	(0.0703)
−3	−0.0039	−0.0028	−0.0064	−0.0753	−0.0028	−0.0199	−0.0051	−0.2008
	(0.0045)	(0.0167)	(0.0065)	(0.0553)	(0.0035)	(0.0228)	(0.0038)	(0.0755)
−5	−0.0075	−0.0336	−0.0038	−0.1012	0.0042	−0.0238	0.0096	−0.1824
	(0.0036)	(0.0118)	(0.0053)	(0.0462)	(0.0038)	(0.0153)	(0.0039)	(0.6500)
−9	−0.0073	0.0046	−0.0047	−0.0615	−0.0004	−0.0200	0.0003	−0.1892
	(0.0049)	(0.0119)	(0.0074)	(0.0458)	(0.0010)	(0.0061)	(0.0006)	(0.0613)
−13	−0.0054	−0.0239	−0.0002	−0.1264	−0.0009	0.0056	0.0048	−0.1676
	(0.0049)	(0.0141)	(0.0054)	(0.0530)	(0.0036)	(0.0138)	(0.0042)	(0.0671)

[a]Greater than weeks −1 through −13 at the 95 percent confidence level.
[b]Less than weeks 0 through +13 at the 99 percent confidence level.

To ensure that neither the NMS stocks nor the non-NMS stocks are individually driving the other results, I run the volume and returns tests separately on each subgroup and find no meaningful difference in their results.

IV. Conclusions

In this paper I examine a sample of initial public offerings that were issued prior to the Tax Reform Act of 1986, and a sample that were issued after TRA '86. The assumption underlying this analysis is that a significant subset of the investors who purchased the pre-TRA '86 IPOs at the offer price on the issue date held the stock to at least three weeks prior to the date the stock would qualify for long-term capital gain or loss status. I assume also that a further subset planned to sell the stock somewhere around that time but had enough flexibility in that decision to be able to select the week of the sale so as to maximize their after-tax return.

I separate the stock samples into two groups, those that appreciated in price prior to the time they qualified for long-term status, and those that depreciated in price prior to qualification. My hypothesis is that discretionary taxpaying liquidity traders will delay the sale of the appreciated stock until after the qualification date but will accelerate the sale of the depreciated stock prior to the qualification date. I further predict that the incentive to sell the depreciated stock prior to qualification is stronger than the incentive to sell the appreciated stock after qualification. The results of this paper are consistent with these predictions.

During the week after qualification, the Appreciated group of the pre-TRA '86 sample shows a significant increase in volume along with a significant decrease in returns. There is a significant negative relationship between price appreciation and returns during that week and a significant positive relationship between price appreciation and volume. In contrast, there do not appear to be any similar relations in the post-TRA '86 sample.

During the week prior to qualification, the Depreciated group of the pre-TRA '86 sample shows a significant increase in volume as well as a significant decrease in returns. There is a significant positive relationship between price appreciation and returns during the week and a significant negative relationship between price appreciation and volume. I find none of these results in the post-TRA '86 sample.

Additional research can focus on the relationship between these results and the tax-loss selling hypothesis for the turn-of-the-year effect (see Dyl (1977), Reinganum (1983), Haugen and Lakonishok (1987), and Ritter (1988)). The critical assumption behind the tax-loss selling hypothesis is that individual investors will accelerate the sale of depreciated stocks in order to realize current year losses. Evidence in support of this behavior, outside of the turn-of-the-year effect, however, has not previously been demonstrated. The results of the tests in this paper support the belief that tax conse-

quences motivate investors and can impact a stock's volume and returns. Since this view underlies the tax-loss selling explanation for the turn-of-the-year effect, it provides support for this explanation.

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